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Virginia Institute of Marine Science

The Virginia Wetlands Report

Spring 1995
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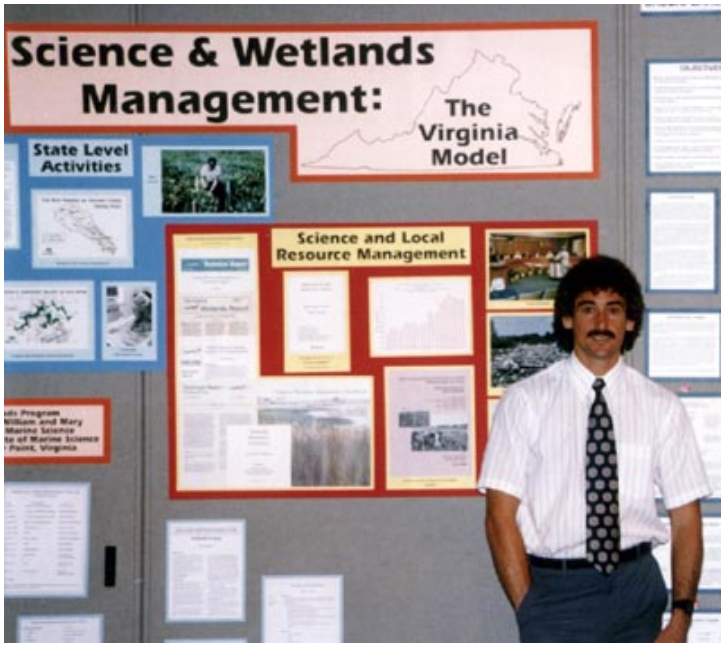
VIMS and DEQ Water Division Complete Joint Study of Nontidal Wetland Scientific Advisory Needs

Lyle M. Varnell and Thomas A. Barnard, Jr.

Approximately 882,000 acres of wetlands are located within the borders of the Commonwealth of Virginia (Odum 1988). Including the extensive marshes on the seaside of the Eastern Shore, tidal wetlands make up about 24 percent, or 213,000 acres, of this total (VIMS Coastal Inventory Program). Since the enactment of the Wetlands Act in 1972, tidal wetlands regulation in Virginia has included General Fund support of scientific advisory activities by VIMS in support of local wetlands boards and the Virginia Marine Resources Commission (VMRC). Scientific advisory activities and inputs are, in large part, responsible for the effective management of this valuable resource. The scientific advisory input which has historically been provided by VIMS has helped to assure fairness and consistency in the environmental impact assessment portion of the wetland decision-making process. Virginia's tidal wetlands management and advisory program has gained national respect and has become a model for coastal management.

In 1989 the Commonwealth began to more fully utilize the capabilities and authority delegated under Section 401 of the Clean Water Act, which includes protection of both tidal and nontidal wetlands. The Department of Environmental Quality, Water Division (DEQ-W) is responsible for managing this program (also called the Virginia Water Protection Program, VWPP). Through the current Virginia Joint Permit Application processing procedures, DEQ-W receives scientific advisory reports from VIMS for activities which are proposed to impact tidal wetlands. Scientific advice on nontidal wetland issues and projects are currently provided only on an *as-requested* and *as-time-allows* basis by VIMS. As the Sec. 401 responsibilities have grown, so has the need for a consistent program of scientific advice and assistance. In an effort to quantify technical advisory needs in this area, VIMS and DEQ-W conducted a two-part joint study in 1993-94. Support for the project was provided by the U.S. Environmental Protection Agency.



VIMS Tidal Wetlands Education Seminar attracts more than 100 participants annually.

Although the full array of nontidal wetland types were generally known for Virginia, the relative extent of developmental pressures on

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VIMS and DEC Joint Study
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these classes was unknown. Through this study, we were able to analyze three years of data from the U.S. Army Corps of Engineers' permit activity database and determine general development activity trends by physiographic province (coastal plain, piedmont and mountain). This study did not include activities covered under Corps Nationwide or General permit categories. Data provided by DEQ was also used in the analysis. In each year of the study, applications for residential development accounted for the greatest number of permits in the coastal plain and mountain provinces. In contrast, the permit activity maximums varied between municipal, commercial and agricultural activities each year in the piedmont province. The greatest amount of total nontidal wetland permit activity and losses occurred in the coastal plain province throughout the study. This was not unexpected since this area contains both the greatest population growth pressures and the greatest acreage of nontidal wetlands.

Of the major nontidal wetland types impacted through the permit process, palustrine forested and palustrine emergent incurred the greatest losses. The "palustrine" classification includes wetlands traditionally recognized as nontidal marshes, swamps and bogs. Compensatory mitigation was also greatest for palustrine wetlands. Losses were also quantified for riverine and lacustrine (generally, lakes and reservoirs) wetlands, but the losses in these classes were significantly less than losses to palustrine wetlands. Details of the findings from this part of the study are included in *A Review of Nontidal Wetland Projects and Impacts in Virginia, 1991-1993*, Final Report to the Environmental Protection Agency, Virginia Institute of Marine Science, Gloucester Point, VA 23062.*

The second part of the study required a detailed review of the Virginia Water Protection Program (VWPP). General DEQ-W program operation, decision-making protocols and mandated time requirements were targeted for assessment along with current project assessment meth-

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The Virginia Wetlands Report

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In this issue:

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Student Amanda McKenney (l) assists scientist Julie Bradshaw assess the functional value of a forested nontidal wetland.

*A limited number of copies of this report are available from the Wetlands Program, Virginia Institute of Marine Science, College of William and Mary, P.O. Box 1346, Gloucester Point, Virginia 23062.

Feathers & Fins

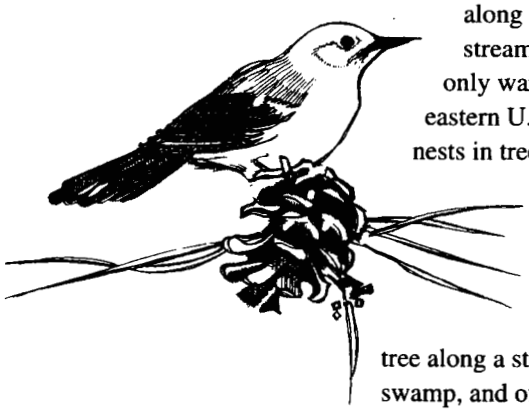
Prothonotary Warbler

(Protonotaria citrea)

Julie G. Bradshaw

If you see a flash of golden yellow while canoeing through southeastern Virginia's cypress swamps or along its creeks or small rivers during the spring and summer, you are likely to be in the territory of the prothonotary, or "golden swamp," warbler. The prothonotary warbler's scientific name, *Protonotaria citrea*, describes its appearance. *Protonotaria* stems from the Catholic church, denoting a papal notary who wears a yellow hood, and *citrea* is Latin for "lemon color." The head and belly of the male prothonotary warbler are bright golden yellow, and its dark eyes are large and prominent on this bright background. Its wings are blue-gray and do not have wing bars. Its back is olive green, and its tail is blue-gray with large white patches. The prothonotary's song is a loud series of "sweet" or "zweet" notes.

The prothonotary warbler is found during breeding season in mature deciduous floodplain forests and swamps on the east coast of the U.S. to New England and along the Mississippi River valley. It requires dense underbrush along the banks of streams. It is the only warbler of the eastern U.S. which nests in tree cavities. Usually it chooses a nest site which is low in a tree along a stream or in a swamp, and often nests directly over water. There is generally heavy competition for nest sites with other cavity nesters such as Carolina and house wrens, tree swallows, chickadees, and woodpeckers. Morse (1989) has suggested that this competition may be responsible for the strong territoriality of the prothonotary warbler.



The prothonotary is a neotropical migrant, spending its winters in Central America and northwestern South Amer-

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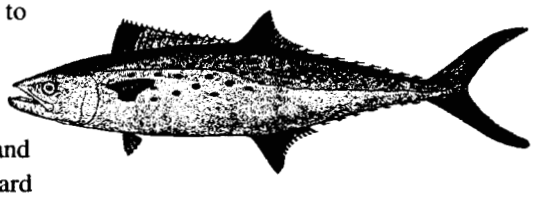
Spanish Mackerel

(Scomberomorus maculatus)

Lyle Varnell

The spanish mackerel is a popular food and game fish in the lower Chesapeake Bay and near-shore waters along the eastern United States and Gulf of Mexico. It is found in estuarine and oceanic waters from the Gulf of Maine to the Florida Keys and westward along the Gulf Coast to the Yucatan Peninsula. Historically, it is most abundant in ocean waters south of Cape Hatteras. In recent years, however, Chesapeake Bay populations have increased. This is generally believed to be a result of successful fisheries management strategies enacted by the South Atlantic states. Increases in south Atlantic Spanish mackerel populations have led to increased numbers of the species in local waters. Due to its greater relative commercial and recreational importance to the south Atlantic states, studies of this species' life history and ecology have mainly focused on stocks found in the waters off of south Florida.



S. maculatus belongs to the family Scombridae. Other members of this family include king mackerel (*S. cavalla*), wahoo (*Acanthocybium solanderi*), tunas and other common mackerels. Members of the Scombridae share many morphological characteristics, and Spanish mackerel are often misclassified as young king mackerel. Shared characteristics of mackerels include an elongate and compressed body, a slender caudal peduncle with a median lateral keel, two dorsal fins separated by a deep notch, and rows of finlets (generally 8-9 for Spanish mackerel) between the tail fin and the dorsal and anal fins. Distinguishing characteristics of the spanish mackerel include a dark blue body color with sky blue reflections above and silver below. The lateral line slopes down evenly from head to tail (king mackerel have a sudden drop or distinct undulation in the lateral line below the second dorsal fin). Round spots, yellow to brassy in

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Prothonotary Warbler
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ica. Morton (1980) studied wintering birds in the Panama Canal Zone and found prothontaries to be unique for two reasons. They were the only migrant warblers for whom pair bonds were evident (i.e., male and female seen foraging as a pair). They were also the only migrant warblers to roost communally, to the extent that they staged in the same tree each night at dusk before flying together to their final roost. In this way they act less like warblers and more like orchard orioles and similar gregarious birds from the Icterid family (which includes blackbirds, grackles, orioles, meadowlarks, and cowbirds). All other warbler species that Morton observed roosted alone.

The prothonotary warbler eats insects, foraging on the ground or low on vegetation near the water. The location of nesting and foraging sites low to the ground or water, and the frequent proximity to navigable water makes the prothonotary warbler a very pleasant species to observe.

Prothonotary warblers are one of the many species of neotropical migrants whose population is in decline, according to analysis of data from the Breeding Bird Surveys conducted since 1966 by the U.S. Fish and Wildlife Service. Land management strategies which maintained old growth stands and wide buffers along streams would probably be beneficial to the future of this species.

References:

Morse, Douglass H. 1989. American warblers: an ecological and behavioral perspective. Harvard Univ. Pr.

Morton, Eugene S. 1980. Adaptations to seasonal changes by migrant land birds in the Panama Canal Zone. p. 437-453 *in* Keast, Allen & E.S. Morton (eds.) 1980. Migrant birds in the neotropics: ecology, behavior, distribution, & conservation. Smithsonian Inst. Pr.

Spanish mackerel
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color, are located above and below the lateral line (young king mackerel have spots similar in color). Spanish mackerel have a life span of between 5 and 8 years and have been recorded weighing up to 25 pounds, although specimens this large may have been misidentified king mackerel. Fish found in Chesapeake Bay generally weigh 1 to 3 pounds, but may be found weighing up to 8 pounds.

Spanish mackerel commonly form large schools near the water surface. These fish usually enter Virginia waters in late spring-early summer from the south and remain until approximately September. This species rarely enters estuarine tributaries; preferring the warmer and more saline mainstem waters (salinities greater than 30 ppt and temperatures between 21 and 27°C). Fall migrations are southerly to deeper oceanic waters, overwintering primarily off of south Florida and the Gulf of Mexico.

Spawning generally occurs at night in waters less than 100 feet deep and greater than 25°C. Limited spawning occurs in the mainstem of the Chesapeake Bay, beginning about mid-June. Eggs are believed to hatch within 2 days of spawning. Juveniles prefer near-shore oceanic waters off open beaches but estuaries are also used as nursery grounds. Sexual maturity occurs in the second and third years of life (most fish are mature at lengths of approximately 35 centimeters, or about 14 inches); however, the bulk of the spawning stock is greater than three years old.

Spanish mackerel are pelagic carnivores and feed principally on estuary-dependent species such as menhaden (*Brevoortia tyrannus*) and anchovies (*Anchoa* spp.). Although they are mainly piscivores, they are also known to feed on shrimp (*Penaeus* spp.). Predators of Spanish mackerel include larger members of the mackerel family, dolphins and sharks. Because of their dependence upon estuarine production as food and their importance as prey to larger marine species, spanish mackerel are an important link in the bay to ocean food chain.

Washington and Wetlands: Where Do Things Stand?

The primary Federal law protecting wetlands in this country at present is the Clean Water Act, first passed in 1972 and amended several times since then. The law is up for reauthorization this year and the vehicle to accomplish this is H.R.961, also known as the Shuster bill after its sponsor, Bud Shuster (Rep. of Pennsylvania). The Clean Water Act and H.R.961 actually address much more than just wetlands. Included are: water quality research policy and funding; construction grants; water quality standards and enforcement for both point and non-point sources of pollution; watershed management; stormwater management; risk assessment/cost benefit analysis; and wetlands conservation and management. H.R.961 addresses a number of regulatory reform issues in both water quality and wetlands and is considered highly controversial. It passed the House Transportation and Infrastructure Committee on a vote of 42 to 16 on April 6th and the full House on May 16, on a vote of 240 to 185. A slightly different bill is now being considered in the Senate.

Title VIII of H.R. 961 would replace Section 404 of the Clean Water Act, the portion of the existing law which limits filling of wetlands. Title VIII classifies wetlands into Types A, B and C with Type C wetlands receiving no protection under the law. Type B wetlands would receive some protection although wetland functional alterations would be permitted. Type A wetlands, the most ecologically valuable, would have permits issued only after efforts to avoid, minimize and finally, compensate for lost wetland function. Only 20% of the total wetlands classified per county, city, or town would be allowed in the Type A category, including state and federally owned acreage. If regulatory action diminishes the fair market value of any portion of an owner's private property, the government would have to compensate the owner by an amount equal to that of the diminution. If the loss in value is greater than 50%, the federal government will have to buy the affected portion of the property. States which have been delegated wetlands protection programs under the law would not have to pay compensation.

Other changes mandated in the House-passed bill involve:

1. Elimination of EPA and Fish and Wildlife Service from any roles in wetland regulation.
2. In addition to existing exemptions for normal farming and ranching activities, those on farmed wetlands and incidentally created wetlands would be added.
3. The bill would also exempt activities taking place in states with substantial conserved wetlands such as Alaska.
4. Creation of a new appeals process for landowners and permit applicants to have classification and permit decisions reviewed.
5. Changes in delineation process which significantly reduce the wetland areas subject to the bill.

Proponents say the bill balances property rights and wetlands protection. Opponents say the bill will negate decades of progress made in cleaning up our streams and rivers. President Clinton has vowed to veto the House version if it reaches his desk.➔

VIMS and DEQ Joint Study
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ods used by DEQ-W personnel in rendering permit decisions. This information was evaluated in light of how and where VIMS scientific support could be beneficial to program operations.

In numerous categories, it was determined that VIMS could not contribute to the accuracy or efficiency of the VWPP. The study also indicated seven general categories of subject-specific scientific input and four general categories of education/training of DEQ-W personnel in which VIMS involvement would benefit VWPP and the citizens of Virginia. These are discussed separately below.

Scientific Basis for Regulatory Policy and Principles

Although research efforts are ongoing in Virginia and nationwide, the scientific knowledge base for nontidal wetlands remains less advanced than that for tidal wetlands. In addition, the public in general is less familiar with the functions and values of nontidal wetlands and because of greater vested interests, among other factors, a great deal of political controversy surrounds this natural resource. Therefore, sound manage- ment principles based in science are necessary to justify regulatory requirements and actions. Through a VIMS/DEQ-W cooperative effort, a document similar to the *Wetlands Guidelines* (for tidal wetland regulation) could be developed which would provide state-of-the-science and regulatory information in a "management friendly" form, available to regulators, decision-makers and the general public.

Compensatory Mitigation

The mitigation of wetland losses is an incongruous and controversial policy issue. The difficulties of implementing such a policy are compounded by the questions remaining in the scientific community as to the probability of successfully creating or restoring functional wetlands, defining adequate monitoring methods and determining criteria which define success. The questionable scientific basis of wetland creation and restoration is, in large part, responsible for the controversies surrounding the policy. DEQ-W personnel review approximately 50 mitigation/restoration plans per year. Expertise is generally necessary on a case by case basis.

VIMS scientist Dr. Jim Perry in vegetated wetland. Understanding the function and value of wetlands is an integral part of policy development.

Joint Permit Application/EIS/EA Reviews

The basic review of Joint Permit Applications (JPAs), and the review of Environmental Impact Statements (EISs) or Environmental Assessments (EAs) are responsible for the majority of the workload at DEQ-W. Personnel spend a great amount of time assessing the potential primary environmental impacts of a proposed project to a nontidal wetland or other water body. Through the Virginia tidal wetlands managment model and the state EIS review procedure, the scientific advisory group at VIMS assesses the tidal wetland and other marine environmental impacts. If VIMS were to begin reviewing proposals affecting nontidal wetlands, the advantages would be that (1) the evaluation of aquatic environmental segments of the permit process are placed where the state's expertise is located, (2) processing each component through the appropriate channel assures greater accuracy within the regulatory system and expediency in each permit review, and (3) provides decisionmakers with the best available information, which ultimately should lead to regulatory decisions that are more consistent and justifiable.

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Varied & Versatile Wetlands

Wetlands and People

Pam Mason

Ed.—This is the first installment of a new series for The Virginia Wetlands Report, *which will alternate with the series "Natural Places to Visit." In this column we will highlight some of the many and varied ways people have come to depend upon wetlands. Discussions will explore various peoples of the world, as well as current and historic uses. It may come as a surprise to learn humans have used wetlands for everything from food to building materials.*

Let's start with the basic use of wetlands as a source of food for both people and domesticated animals. We start with one of, if not the oldest, production crops in the world.

Rice production provides a perfect example of the importance of wetlands in food production. Rice *(Oryza sativa)* has been called the world's most important crop (Simpson and Ogorzaly, 1986). One estimate of worldwide rice consumption is over 200 million tons per year. Aside from a source of food, rice is also used to make sake (rice wine) and paper. In the Orient, rice is considered a symbol of fertility providing the beginning of the tradition of throwing rice at weddings.

The first evidence of the use of rice for food comes from Asia, thousands of years before the birth of Christ. From approximately 300 B.C. to 100 A.D. rice production spread throughout the Middle East, and by the 15th century was being grown in southern Europe. Recently, Australia has become a large rice producer. In the United States, major rice producing states include California, Arkansas, Texas, Louisiana, and Mississippi.

Rice needs large quantities of water to grow well. While rice does not need to be grown in standing water, it needs 1.5 to 2 meters of rain a year if it is not grown in this manner. The majority of the world's production is grown in standing water, referred to as "wet rice." Flooded rice fields are commonly called "paddies," and this practice allows for consistent cultivation. After harvest, the remaining plant material quickly rots in the standing water. The detritus provides a substrate for algae which serves as a green fertilizer and the dead plant material is recycled. An important benefit to wet rice production is the elimination of competition from terrestrial weeds which cannot tolerate the wet conditions.

Wild rice, native to the New World and common to Virginia, is not a member of the genus *Oryza*. Wild rice will be discussed in the next installment.

Reference:

Simpson, B. B. and M. C. Ogorzaly. 1986. *Economic Botany.* McGraw-Hill, Inc. N.Y., N.Y.

VIMS and DEQ Joint Study
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Functional Assessment Reviews

Functional assessments are established methods based in existing science which can be applied to wetlands in a consistent manner; the output of which describes the general ecological attributes of a wetland. This information may be used to assess the environmental benefits versus detriments of a proposed project or to determine appropriate compensatory mitigation measures and design, if required. Although the principles of functional assessments are based in science, many aspects are applied and interpreted subjectively by applicants and/or their consultants. This often leads to inconsistencies, inaccuracies and confusion by all parties. Scientific review of functional assessments would contribute to alleviating confusion and improving consistency.

Violations

Violations involve unpermitted activities which alter the structure of a wetland area. Based on historical trends, it is expected that the necessity for handling violations and potential violations will greatly increase. Delineation and restoration are frequently required when violations are encountered and may lead to legal action either by the state or the property owner. Therefore, it is reasonable that the state should rely on its experts in this field for handling violations.

Jurisdictional Determinations

Currently, Virginia must rely on U.S. Army Corps of Engineers' judgement in defining nontidal wet-

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land jurisdiction. Should Virginia rethink this principle in the future and decide to provide DEQ with jurisdictional authority, it would be necessary for DEQ-W to call upon the scientific community as unbiased experts in situations of difficult or controversial wetland delineations.

Research to Support Management Issues and Policies

Natural resource regulatory programs should be based on sound, scientific research and principles. Although science has provided evidence of the importance of nontidal wetlands through research on wetlands functions (the basis for the regulatory programs), many obscurities remain which are relevant to resource management. DEQ-W should have the ability to address issues scientifically. A cooperative effort between VIMS and DEQ-W would allow the Commonwealth to be reactive to outstanding issues and proactive to new issues.

VIMS is currently involved in a long-term study of nontidal forested wetlands created by the Virginia Department of Transportation as compensatory mitigation for road projects in Virginia's coastal plain.

Scientist Tom Barnard leads a wetlands field exercise workshop.

Education in General Wetlands Ecology, Compensatory Mitigation, Jurisdictional Determinations/ Delineations and Requested Technical Subjects

Many of the needs of the VWPP could be met most readily and efficiently by providing education and training to DEQ-W personnel. A structured curriculum dealing with general wetlands ecology, jurisdictional determinations/delineations, mitigation and other subjects as needed would provide a means by which DEQ-W personnel would remain up-to-date on the status of wetlands science.

Through this study, VIMS and DEQ-W personnel were able to identify the major classes of Virginia nontidal wetlands impacted through the permit process relative to other wetland types. Also identified were the major categories of permitted activities affecting these wetland types. The study detailed as well, the segments of the DEQ Water Protection Program where the scientific advice and educational training opportunities available through VIMS would be of significant value to program character and efficiency. Federal grant funds are currently being sought by VIMS to enact a small-scale pilot advisory program.

Reference:

Odum, W.E. 1988. Nontidal freshwater wetlands in Virginia. Virginia Journal of Natural Resources Law 7: 421-434.

Geographic Information Systems

Sixth Annual Virginia GIS Conference

Marcia Berman

The 1995 Sixth Annual Virginia Geographic Information Systems Conference entitled "GIS in Virginia: Chaos and Cohesion" is being held at the Hotel Roanoke on September 28 - 29, 1995. This year's event is hosted by the Fifth Planning District Commission and the Western Virginia Geographic Information Systems Users' Group. The conference is sponsored by the Virginia Association of Planning District Commissions and the Virginia Association for Mapping and Land Information Systems. A number of co-sponsors, including the Virginia Institute of Marine Science will participate.

The conference agenda is taking a slightly different approach than previous years, and should be of great interest to those currently running GIS programs, or those who are in the planning stages. Three separate tracks have been identified. Track 1 will showcase development of GIS programs from administration and management to staffing. It will include presentations that describe existing program and database development from both public and private sectors. Track 2 will focus on the administration of GIS programs and GIS databases. Expected are discussions on data sharing, data confidentiality, and copy right. Track 3 highlights the industry perspective as related to emerging markets and technological advancements. This should provide some insight into future developments in the field of GIS with valuable information to guide programs in their future planning.

In the past, the conference has offered opportunities to meet with various experts in the GIS, surveying, and photogrammetry fields from state, federal, and private agencies. This year should be no exception. Leading manufacturers and developers of GIS software and data will spotlight their newest technologies and advancements. State and Federal departments will display recent data acquisitions and developments. Historically, the conference has been an excellent forum to learn who is collecting data for public programs, where data can be acquired, and when new data sources will be available.

For information on the conference agenda, registration, or directions, contact Matt Miller, Fifth Planning District Commission, PO Box 2569, Roanoke, Virginia 24010 [(703) 343-4417].

Wondering about Wetlands

Q What are nonvegetated wetlands and why are they valuable?

A The casual observer might at first glance question there being any value to a seemingly barren, sometimes smelly mud flat. Without the typical marsh grasses normally associated with our coastal wetlands one might wonder why the State of Virginia, in the Tidal Wetlands Guidelines, ranks nonvegetated tidal flats second in value to the more obviously productive vegetated wetlands with their varied species of sedges and grasses?

In actuality, these seemingly uninhabited nonvegetated wetlands "come alive" as they are covered by the rising tide. Tidal flats are highly valued based on their ability to provide food and habitat for various species of marine animals and shore birds, and to buffer coastal erosion and mediate water quality through nutrient recycling.

Primary production in tidal flats is a result of microalgae like diatoms, dinoflagellates or blue-green algae and macroalgae like sea lettuce. Sport and commercial fish species utilize these and other forms of algae as a source of food as do numerous other bottom dwelling organisms such as blue crabs, clams, worms, shrimps, sponges, barnacles and snails. Migratory, as well as resident waterfowl, utilize the abundant life found on tidal flats as a source of food. It has been estimated that in one square meter of mud flat one could expect to find 5,300 to 8,300 organisms, hardly a barren marine environment.

Tidal flats, which lie channelward of the shore, intercept and trip incoming waves thereby dissipating some of the wave's energy prior to landfall and buffer-

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Wondering about Wetlands
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ing shoreline erosion. Sand stored in offshore intertidal bars during mild weather periods, may move inshore to replace beach sand lost during storms or rough weather. Thus, beaches are able to rebuild after storms and maintain their erosion buffering function.

Probably the most important values of these mud flats are those of mediating the breakdown of plant detrital material into more readily useable compounds and catalyzing the process of recycling and exchanging nutrients within the estuary.

So remember, although a smelly mud flat appears to be both lifeless and worthless, in reality, it is an extremely important part of our Bay's ecosystem, responsible for improving water quality, providing habitat and recycling nutrients, not to mention, abounding with marine life.

Calendar of Upcoming Events

September 28-29, 1995	1995 6th Annual Virginia GIS Conference "GIS in Virginia: Chaos and Cohesion" Hotel Roanoke, Roanoke, Virginia Sponsored by the Virginia Association of Planning District Commissions and the Virginia Association of Mapping and Land Information Systems
November 12-16, 1995	Estuarine Research Federation Conference '95 "Estuaries: Bridges from Watersheds to Coastal Seas." Corpus Christi, Texas Additional information will be in the next *Wetlands Report.*

Wetlands Program

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